

**Rec'd PCT/PTO 02 MAR 2005**

# PATENT COOPERATION TREATY

10/526396

# PCT

## INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter II of the Patent Cooperation Treaty)

**(PCT Article 36 and Rule 70)**

Applicant's or agent's file reference 300471WO/KCS/DG		FOR FURTHER ACTION : See Form PCT/IPEA/416	
International application No. PCT/IB 2002/003611		International filing date (day/month/year) 03.09.2002	Priority date (day/month/year)
International Patent Classification (IPC) or national classification and IPC H04B 1/707			
Applicant Nokia Corporation et al			
<p>1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of <u>7</u> sheets, including this cover sheet.</p> <p>3. This report is also accompanied by ANNEXES, comprising:</p> <p>a. <input checked="" type="checkbox"/> (sent to the applicant and to the International Bureau) a total of <u>1</u> sheets, as follows:</p> <p><input checked="" type="checkbox"/> sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).</p> <p><input type="checkbox"/> sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.</p> <p>b. <input type="checkbox"/> (sent to the International Bureau only) a total of (indicate type and number of electronic carrier(s)) _____, containing a sequence listing and/or tables related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).</p> <p>4. This report contains indications relating to the following items:</p> <p><input checked="" type="checkbox"/> Box No. I Basis of the report</p> <p><input type="checkbox"/> Box No. II Priority</p> <p><input type="checkbox"/> Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</p> <p><input type="checkbox"/> Box No. IV Lack of unity of invention</p> <p><input checked="" type="checkbox"/> Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</p> <p><input type="checkbox"/> Box No. VI Certain documents cited</p> <p><input type="checkbox"/> Box No. VII Certain defects in the international application</p> <p><input checked="" type="checkbox"/> Box No. VIII Certain observations on the international application</p>			
Date of submission of the demand  05.03.2004		Date of completion of this report  14.12.2004	
Name and mailing address of the IPEA/SE Patent- och registreringsverket Box 5055 S-102 42 STOCKHOLM Facsimile No. +46 8 667 72 88		Authorized officer  Peder Gjervaldsaeter/BS Telephone No. +46 8 782 25 00	

Form PCT/IPEA/409 (cover sheet) (January 2004)

# INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.

PCT/IB 2002/003611

## Box No. I Basis of the report

1. With regard to the language, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.

- ☐ This report is based on a translation from the original language into the following language \_\_\_\_\_, which is the language of a translation furnished for the purposes of:
- ☐ international search (under Rules 12.3 and 23.1(b))
  - ☐ publication of the international application (under Rule 12.4)
  - ☐ international preliminary examination (under Rules 55.2 and/or 55.3)

2. With regard to the elements of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report)*:

- ☐ the international application as originally filed/furnished
- ☒ the description:
- pages 1-27 as originally filed/furnished
- pages\* \_\_\_\_\_ received by this Authority on \_\_\_\_\_
- pages\* \_\_\_\_\_ received by this Authority on \_\_\_\_\_
- ☒ the claims:
- pages 28-31, 33 as originally filed/furnished
- pages\* \_\_\_\_\_ as amended (together with any statement) under Article 19
- pages\* 32 received by this Authority on 23.07.2004
- pages\* \_\_\_\_\_ received by this Authority on \_\_\_\_\_
- ☒ the drawings:
- pages 1-7 as originally filed/furnished
- pages\* \_\_\_\_\_ received by this Authority on \_\_\_\_\_
- pages\* \_\_\_\_\_ received by this Authority on \_\_\_\_\_
- ☐ a sequence listing and/or any related table(s) – see Supplemental Box Relating to Sequence Listing.

3. ☐ The amendments have resulted in the cancellation of:

- ☐ the description, pages \_\_\_\_\_
- ☐ the claims, Nos. \_\_\_\_\_
- ☐ the drawings, sheets/figs \_\_\_\_\_
- ☐ the sequence listing (*specify*): \_\_\_\_\_
- ☐ any table(s) related to the sequence listing (*specify*): \_\_\_\_\_

4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).

- ☐ the description, pages \_\_\_\_\_
- ☐ the claims, Nos. \_\_\_\_\_
- ☐ the drawings, sheets/figs \_\_\_\_\_
- ☐ the sequence listing (*specify*): \_\_\_\_\_
- ☐ any table(s) related to the sequence listing (*specify*): \_\_\_\_\_

\* If item 4 applies, some or all of those sheets may be marked "superseded."

# INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.

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**Box No. V** Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

## 1. Statement

Novelty (N)	Claims	<u>1-30</u>	YES
	Claims		NO
Inventive step (IS)	Claims		YES
	Claims	<u>1-30</u>	NO
Industrial applicability (IA)	Claims	<u>1-30</u>	YES
	Claims		NO

## 2. Citations and explanations (Rule 70.7)

### The claimed invention

The claimed invention relates to the problem concerning correct estimation of weights used in a rake receiver. The problem is solved by calculating an average correlation between the spreading code of interest and the interfering spreading codes. This correlation is then used when calculating the weights used for weighting two versions of the same signal received at two different times.

### Prior art

In the International Search Report the following documents were cited:

D1: WO 0 101 595

D2: US 5 559 829

D3: IEEE 1997, Pursley et al.: "Evaluation of correlation parameters for periodic sequences"

D4: WO 02 052743

D5: ISCE '97, Boon Kiong Kok et al.: "Effects of spreading chip waveform pulse-shaping on the performance of DS-CDMA indoor radio personal communication system in a frequency-selective Rician fading channel"

D6: IEEE 1995, Schotten et al.: "New non-linear families of code-sequences with correlation properties better than linear families"

D7: IEEE 2000, Stanczak et al.: "Influence of periodic correlation properties of sequences on the sum capacity of CDMA systems"

D1 describes weight factor estimation in a rake receiver.

.../...

**Supplemental Box**

In case the space in any of the preceding boxes is not sufficient.

Continuation of: Box V

According to D1, the weight factors are calculated based on an estimated composite channel response and an estimated impairment correlation. When estimating the impairment correlation the power of an interfering spread spectrum signal is determined by correlating the composite signal with the spreading sequence of the interfering signal. The spreading sequence is transmitted by the base station to the terminal. (See claims 1, 2, 4, 7, 8.)

D2 describes a method of constructing spreading codes. It is also stated in D2 that a rake receiver requires use of spreading codes having good partial aperiodic cross-correlation properties in order to optimise receiving performance in the presence of multi user interference. Equations for calculating partial aperiodic autocorrelation and cross-correlation are also described. (See column 2, line 25-65.)

D3 describes calculation of aperiodic cross-correlation and autocorrelation functions for binary sequences. (See section II.)

Documents D4-D7 represent the prior art. The claimed invention is not considered to be anticipated by these documents.

**Statement of reason**

Claims 1 and 28-30

The method for weight factor calculation known from D1 is considered to represent the closest prior art.

What is claimed in claims 1 and 28-30 differs from what is known from D1 in that correlations between the code of interest and the interfering spreading codes are calculated in claims 1, 28, 29 and 30.

(It is not very clear from the wordings of claims 1 and 29 that these correlations are calculated. It is also not clear from the wordings of claim 1, 28, 29 and 30 in which kind of receiver the invention is implemented. See box VIII. However, this argumentation, regarding inventive step, has been written as if these claims would have been amended to include the

.../...

## Supplemental Box

In case the space in any of the preceding boxes is not sufficient.

Continuation of: Box V

features pointed out in box VIII.)

The problem concerning more correctly calculating weight factors when interfering signals exist has to be solved in D1.

A person skilled in the art facing this problem would find a solution in D2. D2 shows how to calculate correlations between a code associated with a wanted signal and codes associated with interfering signals. It is also stated in D2 that the correlations between used codes have an effect on the performance of rake receivers when multi user interference is present.

A person skilled in the art, having the method known from D1 as a starting point, aiming to solve the identified problem would with the knowledge of D2 calculate correlations between the wanted signal and interfering signals and use these correlations in the weight factor calculations in D1.

Since D1 and D2 both relate to the same technical field and no unexpected effect is obtained the combination of what is known from D1 and D2 is considered obvious for a person skilled in the art. The invention claimed in claims 1 and 28-30 is thus not considered to involve an inventive step over D1 combined with D2.

A combination of what is known from D1 with what is known from D3 would also have given the invention claimed in claims 1 and 28-30. What is claimed in these claims therefore also fails to involve an inventive step over D1 combined with D3.

#### Claims 2-25

These claims contain features that are either known from D1 or D2 or are considered to only constitute details obvious for a person skilled in the art. What is claimed in claims 2-25 is thus not considered to involve an inventive step.

#### Claims 26 and 27

See arguments above regarding claim 1.

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**Supplemental Box**

In case the space in any of the preceding boxes is not sufficient.

Continuation of: Box V

To sum up:

What is claimed in claims 1-30 is novel and comprises industrial applicability but fails to involve an inventive step.

The independent claims are also fail to comply with Article 6 PCT.

**Box No. VIII Certain observations on the international application**

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

It is clear from the description that the following features are essential to the definition of the invention:

- (1) the receiver is a rake receiver
- (2) correlations between a code of interest and possible interfering codes are calculated and used when calculating the weight factors

Since independent claim 1 and 28-30 do not contain both of these features they do not meet the requirement following from Article 6 PCT taken in combination with Rule 6.3(b) PCT that any independent claim must contain all the technical features essential to the definition of the invention.

**Note:**

According to the description, the application aims to solve a correlation problem arising in a rake receiver. (See for example the last paragraph on page 25.) The independent claims must therefore also be restricted to a rake receiver.

The present wording of the independent claims is broad and only states that there should be a number of receiving means receiving the same signal at different times. The present claims thus describe almost any diversity receiver (for example a space-time diversity receiver). The present claims also describe any receiver having an antenna array comprising a number of antenna elements (receiving means) that receive the same signal at different times (due to the time of arrival at the elements). The independent claims thus describe much more than what is described in the description and do therefore not comply with Article 6 PCT as stated above.

Claims 28 and 30 fail to state what kind of codes they are referring to.

Claim 30 also fails to specify what kind of combination that is performed.

It seems impossible for a skilled person to perform the invention according to claims 30 since it is not from the claim clear which kind of combination is performed, what kind of codes are meant and what kind of receiver is used. The independent claim 30 thus also fails to comply with Article 6 PCT as stated above.

26. A receiver as claimed in any preceding claim, wherein means are provided for calculating an average correlation between a code of interest and  $n$  possible interfering codes.

27. A receiver as claimed in claim 26, wherein said average correlation is used to determine said weights.

28. A receiver for use in a communications system, said receiver having a plurality of receiving means, at least two of said receiving means arranged to process the same signal received at different times;

means for calculating the average correlation between a code of interest and  $n$  possible interfering codes

means for combining the output of at least two of said receiving means with different weights, said weights being arranged to take into account said average correlation.

29. A receiving method for use in a communications system, said method comprising:

receiving with different receiving means the same signal received at different times;

determining weights for outputs of said receiving means, said weights being arranged to take into account information relating to a spreading code of at least one signal other than said same signal; and

combining the output of at least two of said receiving means with said weights.

30. A receiving method for use in a communications system, said method comprising the steps of: